1:Vaillant A-5 (1928-1936)1941 NU7 Aztec NU7

tions. The original inventors and innovators are lost in the black obscurity of American history, but the fruit of their ingenuity plays an important part in our modern economy.

As opposed to this wealth of plants, the Aztecs were poor in domesticated animals. They had several varieties of dog, one of which was bred for food, but they never used this animal for transport as did Indians of our Northern plains. The turkey was their chief domesticated fowl, although there is some evidence that they bred geese, ducks and quail also. In plantations of the nopal cactus they carefully tended the cochineal bug for the rich crimson dye it yielded when crushed. A second insect, the maguey slug, still retains its place as a delicacy of the Mexican table, served with another typically Aztec dish, *guacamole*,* a thick mixture of tomato, alligator pear and chile.

Hunting, when possible, produced food, but as early as Upper Middle Culture times the deer were nearly all killed off. The seasonal migrations of the birds, which still visit the lakes of Mexico, offered a profusion of geese, ducks and other wild fowl. Small fish, netted or speared with a trident, were sometimes consumed, and the eggs which a certain fly lays on the lakes were made into a paste still eaten in Mexican communities. The high functionaries, since they were supported by the community, kept a much better table than the poor, who lived meagerly off the produce of their own fields; the daily repast of Montezuma was described by the Spanish conquerors as the height of Lucullan luxury.[18]

Tools showed relatively little variation from Middle Culture to Aztec times. The *coa*, or digging stick, was the chief farming instrument, and the *metate* and *mano* even now re-

*Wah-ca-mo'-lay.

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The most famous of the edible invertebrates is the *axayácatl*, referred to as *axaxayácatl* by Sahagún and Hernandez. Although modern writers (Vaillant, 1941; Apenes, 1943; Linné, 1948; Anderson and Dibble, 1954) persist in calling these insects flies, it has been known for more than a century that they are corixid waterbugs. Sahagún's Spanish word was *coquillo*, not *mosco* or *mosquillo*, so the confusion is not his fault. In post-Conquest times the dried adult insects have been widely sold in the markets of the world as food for caged birds, but they were also used as human food; Hernandez says that they were cooked in maize leaves in nitrous water. Hernandez also makes it clear that these insects are the source of *ahuautli*, a cake made from the eggs that is still much eaten in Mexico, particularly on watch-nights such as Christmas Eve and Holy Thursday. That *ahuautli* was formerly a staple that survives as a delicacy is suggested by its name, which is derived from *atl*, water, and *huautli*, amaranth seed. Now that Sauer (1950) has cleared up some of the indescribable confusion surrounding the use of grain amaranths in aboriginal Mexico, we can begin to appreciate that *ahuautli* was really "water grain", though not in the literal sense of "water wheat" implied by Tylor (1861), whose etymology has confused such later writers as Packard (1871). The identity of the insects is an equally tangled bibliographic problem in which the zoologists have hardly been more helpful than the historians.

The fullest and most authoritative-sounding account is that of Orozco y Berra, given in his memoir on the hydrography of the Valley of Mexico (1864). This historian quoted in full de la Llave's description (1832; reprinted 1887) of the adult insect under the name *Ahuautlea mexicana* (which appears to be the correct name, though it has been ignored by zoological writers; it has priority over the generic name *Krisousacorixa* Hungerford 1930 and the specific name *Corixa femorata* Guérin-Meneville 1857). He described the cultivation of *ahuautli*, which is accomplished by placing bundles of *tules* (*Scirpus* or *Typha*) in the water of Lake Texcoco, stripping off the eggs which the insects lay in countless millions, and processing them into cakes. This much of Orozco y Berra's work is correct; it is fully confirmed by the modern observations of Ancona (1933), and, if there is any doubt that the practice is an aboriginal one, the doubt is removed by Sahagún's figures, reproduced in Plate I, nos. 220–221. Professor Hutchinson assures me that no. 220 is certainly the oldest known figure of a corixid waterbug. Oddly enough, Sahagún does not describe the practice or mention *ahuautli* with the edible insects in Book Eleven, though he lists it among the products sold in the market in the 19th chapter of Book Eight. Hernandez repairs the omission.

Ancona's account (1933) is the only one by a modern zoologist, and

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a salt lake, and Aldrich (1912) gives a graphic account of *Ephydra gracilis* Packard on the Great Salt Lake, Utah, and of *Ephydra hians* on Mono Lake, California. The latter are not only collected in quantity and eaten by Paiute Indians, but were bred out of supposed "larvae" of the *axayácatl* of Lake Texcoco by Peñafiel (1884) and identified by Williston, who referred to Peñafiel's specimens in 1883 and again in 1896. Even Ancona overlooked the fact that Peñafiel's larvae could have nothing to do with a corixid, so that Aldrich's remark, "it seems that the Diptera and the Hemiptera are mingled together in the quotations", is an understatement.

The pupae of ephydrids come to the surface and undergo mass emergence, and it is then (in September) that they are collected and processed as *kootsabe* by the Paiutes of Mono Lake. In all probability this is the product that the Aztecs called *cuculin*. (The words sound distantly related, which is not inconceivable, as Paiute is a member of the Uto-Aztecan linguistic group). The substance is definitely confounded with *tecuitlatl* by Orozco y Berra, however, and the suggestion that it is made of the pupae of *Ephydra hians* is made with due hesitation. As Aldrich said, "only an investigation by an entomologist at the lake can clear up the confusion" (1912, p. 92). Though Sahagún does not mention *cuculin*, nos. 224 to 227 in Plate I appear to depict stages in its manufacture, or in the collection of the larvae, *izcauitli*.

The puzzling stuff called *tecuitlatl* is mentioned by Sahagún in Book Eight, and listed (as *tecuiltlatl*) with the lower animals in Book Eleven. He describes it as *"urronas"* (*"urrosas"* in Lord Kingsborough's edition (1831–48), but neither form occurs in any dictionary I have consulted nor does my own reading "orroras") which grow on the water, have a purple color, and are harvested, dried on mud, and made into cakes. Anderson and Dibble translate the Nahuatl word as "scum", and the material is probably algal. Pomar (García Icazbalceta's edition, p. 59) refers to it as "green sheets that grow, which, when made into a cake and baked, take on a dark green color, and which the Spaniards call *queso de la tierra*". Hernandez, who lists it among the minerals, confirms the purple or green color ("color adhuc recenti cyaneus, aut viridis"). López de Gómara, who was never in Mexico, but who published in 1552 a delightful book on the Conquest that has been a best-seller for four hundred years, adds the suggestive detail that the substance (which he does not name) was gathered on "threshing floors" (*eras*) like those in which salt is made. He said that it is eaten as we eat cheese, and described its flavor as salty, but very good with *chilmolli* (1943 edition, pp. 238–239); continuing with the sonorous text of the first English edition (1578, reprinted in facsimile 1940) from

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which the above details are omitted, "yea, and they holde opinion that this skume or fatnesse of the water, is ye cause that such great number of foule cometh to the lake, which in the winter season is infinite."

Linné (1948), who considers that the substance was an alga that is no longer used, identifies it with the cakes that Bernal Diaz del Castillo saw being sold in the market at Tlatelolco, and which he described as having a cheeselike flavor (1928 edition, p. 300). It is not improbable that Diaz' cakes were made of corixid eggs, *ahuautli*, and it is conceivable that Sahagún's substance was also, though the reference to purple color makes it unlikely. If purple *Oscillatoria* or *Nostoc* were used as food at the time of Conquest, they are doubtless so used today, but the scene of the harvest may be expected to have shifted with the changing salinity of the Valley lakes and the decline of native salt manufacture.

The remaining invertebrates on Sahagún's list have drawn no attention from historians, and, possibly for that reason, they can be identified with some confidence. The *acocili* is clearly a crayfish, presumably *Cambarellus montezumae* (Saussure), and this is the modern Mexican name for that animal (DeBuen, 1944 a; Villalobos, 1943). Sahagún distinguishes it from the *camarón*, or shrimp (*Macrobrachium* or *Palaemon*), and discusses the latter in another part of the chapter, though without giving its Nahuatl name. Plate I, no. 219, leaves no doubt of the identification. In that figure it is accompanied by a dytiscid beetle larva, and this is presumably the *ocuiliztac*, which are "muy ligeros en el agua". Finally, the *aneneztli*, which "turns into those bugs (*coquillos*) that have four wings and fly, and are called hawks (*gavilanes*) in Castile", is almost certainly a dragon-fly larva (Odonata). No. 222 in Plate I appears to represent the adult.

One point should not escape notice, in this melancholy record of confusion: four centuries of scholarship have not sufficed to bring limnologic knowledge of the Valley of Mexico up to the stage attained by the Aztecs and used by them in their daily lives.

CHEMISTRY. An inorganic product of the lakes that was also fully exploited was salt. Ethnographic data on saltmaking have been collected by Apenes (1944), and the importance of salt in aboriginal economy has been extensively discussed by Mendizábal (1929; reprinted in the *Obras Completas*, 1946). The latter author points out that evaporation by artificial heat is a practice introduced by the Aztecs and other high cultures of the highlands, and that the archaic method of solar evaporation survives in those areas less subject to Aztec domination. A standard feature of the more sophisticated method is the separation of silt by settling and filtration from the water to be evaporated, and today

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Plate I.

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Nos. 218–227 from the Codex Florentino (Sahagún, 1905–07), illustrating parts of Book Eleven "Of the properties of animals, birds, fishes, trees, herbs, flowers, metals, and rocks, and of colors". No. 218, the first figure of the axolotl, *Amblystoma mexicanum*; No. 219, *a*, the crayfish, *acocili*; *b*, a dystiscid larva, presumably the *ocuiliztac*; Fig. 220, the first figure of a corixid waterbug, the *axayácatl*, *Abuautlea mexicana* de la Ilave (?=*Krisousacorixa azteca* Jaczewski); 221, the *axayácatl* laying its eggs (*ahuautli*) on a cultch of reeds; No. 222, presumed to be Odonata and identified as *anenextli*; No. 223, presumed to be the ephydrid larvae (*Ephydra hians* Say) with which the *izcauitli* is identified; Nos. 224–225, presumably the harvesting of *cuculin* (not mentioned in Sahagún's text), identified as probably ephydrid pupae; Nos. 226–227, possibly continuing the subject matter of the previous two pictures, or perhaps depicting the harvest and manufacture of the algal cake *tecuitlatl*.

[end plate I. a]

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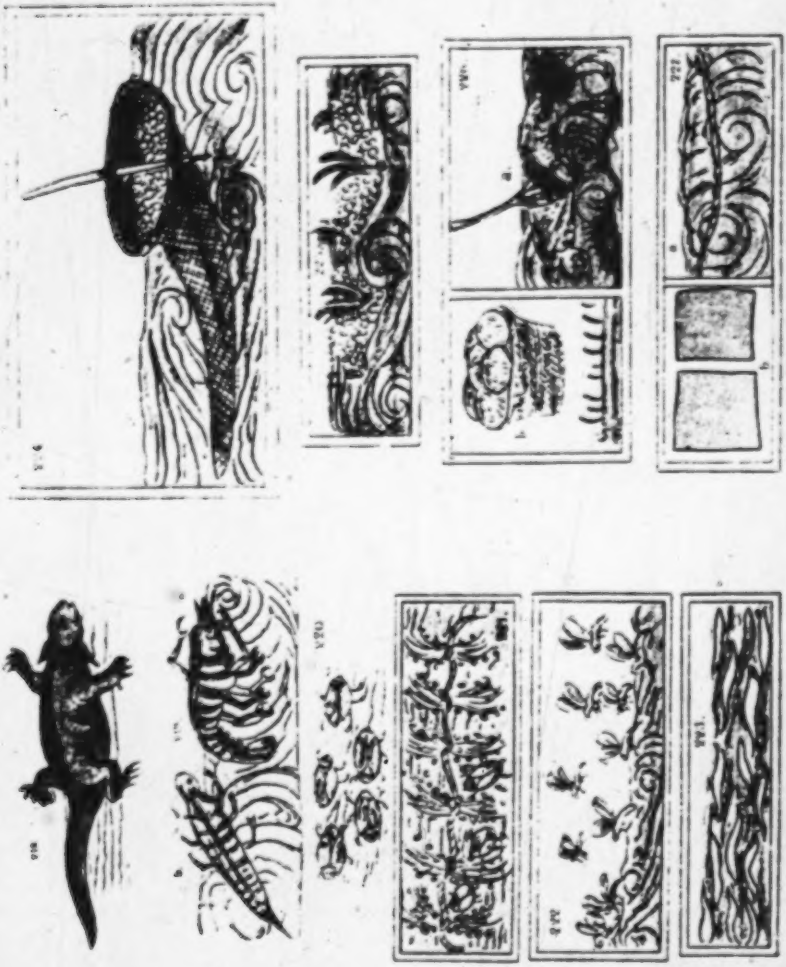
222



[End plate I b]